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OF GENERAL ELECTRIC CO.  
**ENGINEERING  
DEPARTMENT**



Sept. 15, 1927

Bulletin 53

**Farm Lighting**

By  
W. C. BROWN



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# Farm Lighting

*By*  
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ENGINEERING DEPARTMENT  
National Lamp Works of General Electric Co.  
NELA PARK : CLEVELAND, OHIO

## Foreword

*This bulletin deals with methods of farm lighting. Although it is the first use to which electricity is put when it becomes available, lighting has been installed too often in haphazard fashion, without much thought as to the reasons for its use—convenience, comfort, and safety. Of these, safety is perhaps the most important single factor. The farmer has literally been groping his way through the years, trusting to a feeble and uncertain flicker of light to dodge the rusty nail that may lie in wait, and to avoid the obstructions and the pitfalls that are dangerous despite their familiarity. The application of a few simple principles of correct lighting eliminates such hazards and permits the ordinary operations about the farm buildings to be carried on as conveniently during the dark hours as by day.*

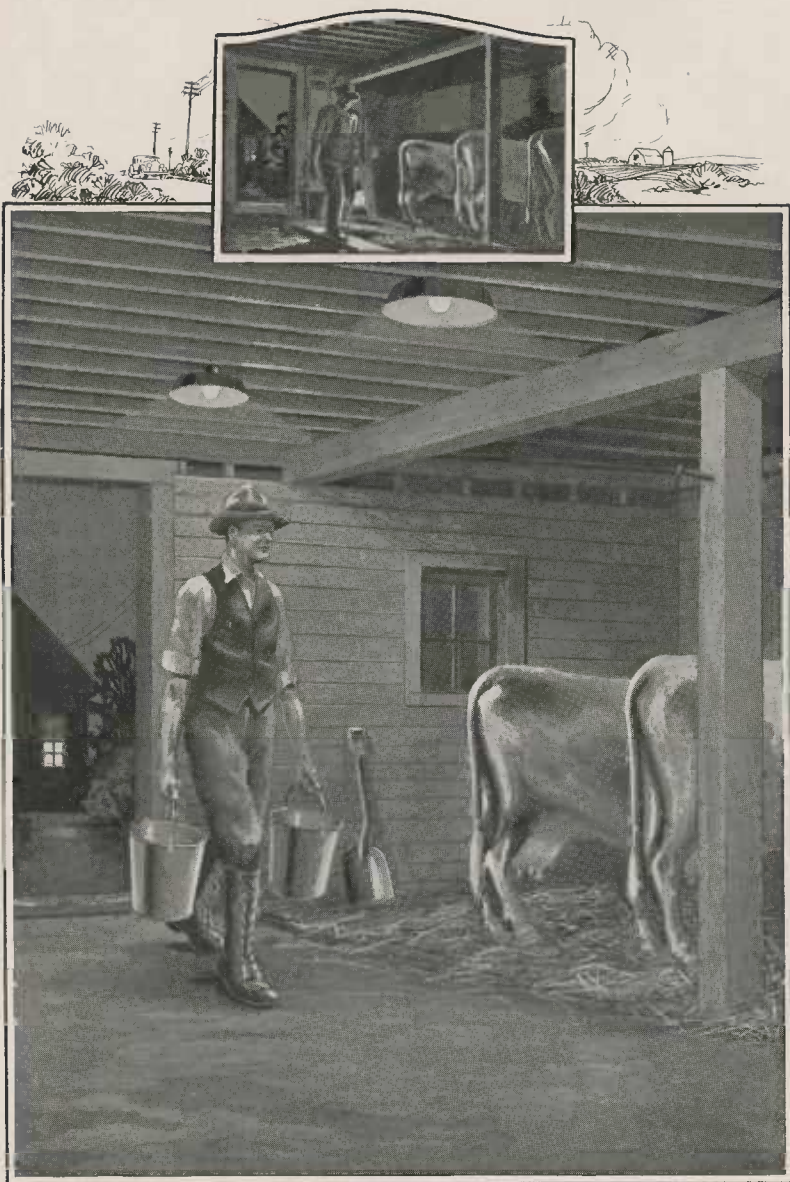


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Good lighting means convenience, comfort, and safety.



## Farm Lighting

America's largest industry is still in the dark! Of the six and a half million farms in this country, less than three-quarters of a million are electrified. Less than three-quarters of a million farms have electric lighting—have comfort and safety instead of gloom and uncertainty. The farmer today wants electric energy, first and always for lighting, but also for the host of conveniences it brings and the time it saves and the soul-wearying tasks it cheerfully performs. Few indeed are the farms, within reach of transmission lines, which are not electrified. The problem is to create conditions which justify the extension of transmission lines.

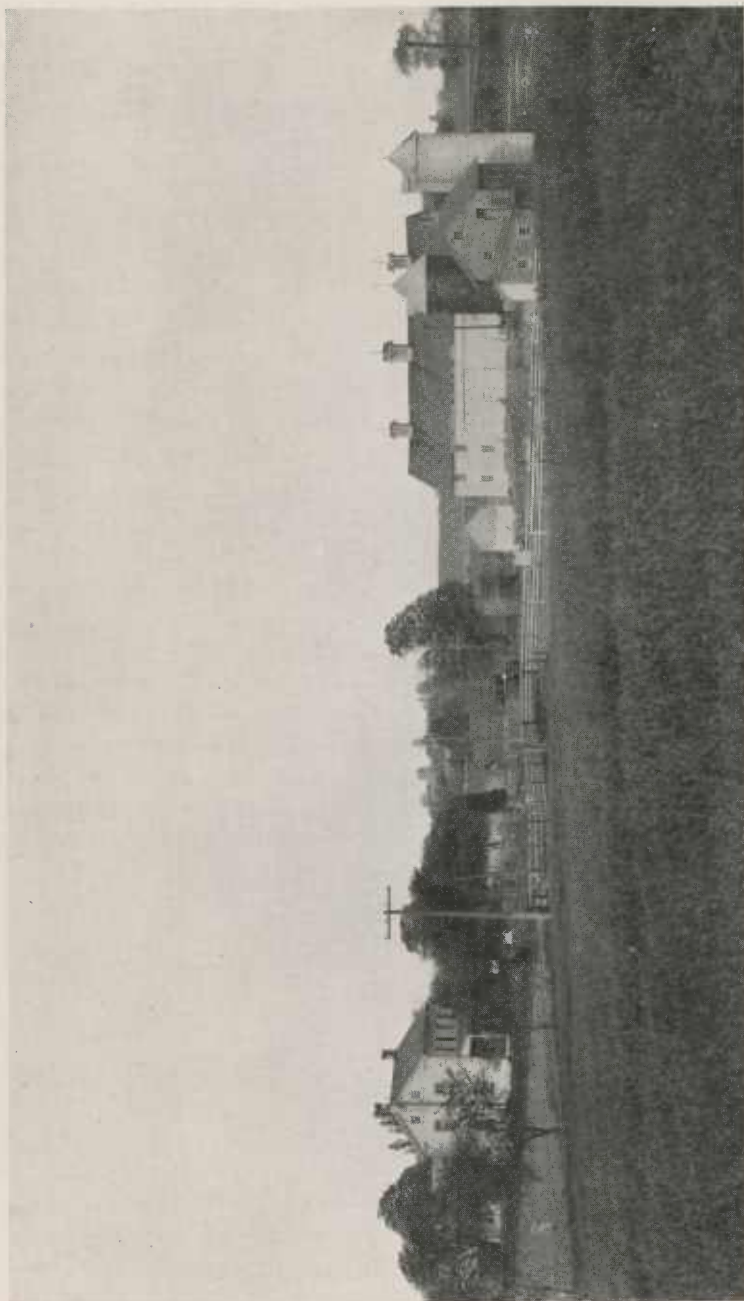
Experience has shown that where the farmer has used electricity for lighting and domestic services only, transmission lines cannot be extended, and supply energy at a price which most farmers can really afford, unless the farmsteads are close together. More than nine-tenths of the cost of electric service supplied to most rural customers has been in the cost of the necessary distribution system. As an illustration, where an automobile is driven only a few miles a month, the principal cost of the transportation service is the investment in the car itself, while the gasoline cost is small; likewise, where a customer consumes only a few kilowatt hours a month, the principal cost of the electric service is the investment in the distribution system, while the cost of generating the energy is small. Hence it is only through the wider application of electricity, with the resultant greater kilowatt-hour consumption, that a low energy rate for farm use becomes practicable.

The experiments now under way in twenty-two states under the direction of the Committee on the Relation of Electricity to Agriculture have been undertaken primarily to ascertain in what ways and to what extent the farmer can use electric power at a saving. As these applications—such as pumping water, churning butter, grinding feed, hoisting hay, cutting and elevating silage—become more numerous, the farther will transmission lines be extended and the more farms will have good lighting. Highway lighting will also make electric service available to many farms; branch lines from the highway lighting circuits can be run to nearby farms at relatively little expense.

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## FARM LIGHTING

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The power line brings to the farm mankind's most versatile servant—electricity.

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## FARM LIGHTING

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### PRINCIPLES OF GOOD LIGHTING

In the lighting of farm buildings there are several principles which must be observed if satisfactory and economical illumination is to be obtained. There must be enough light and it must be properly distributed for the job in hand, there must be no objectionable glare, the correct combinations of lamp and reflector must be used, and the lamps must be of the proper voltage. In addition, the wiring system must be properly designed and installed.

#### Sufficient Light

It is an important basic fact that under better lighting one sees more clearly and more quickly. Many tests have proved that more work is always done with the same physical effort and with less nervous exhaustion when higher levels of lighting are used.

The farmer who does not have electric lighting carries his light source around with him. Because he is accustomed to getting about with no permanent light in the building at all, too often he makes the fallacious assumption that one light source is quite sufficient for each room or area. It is a poor policy to skimp on the number of outlets; where a few additional outlets are needed to do a good job, they cost very little and they add immensely to the satisfaction derived from the lighting system. It is by means of a sufficiency of well-placed outlets and switches that light is carried ahead of the user to the particular places where it is needed. In this bulletin the matters of sufficient light and proper distribution are covered in terms of wattages and spacings that are satisfactory and practical for farm buildings.

#### Avoidance of Glare



Glare hinders vision.

The filaments of incandescent lamps are extremely bright, and not only are unpleasant to look at, but may even be harmful if looked at for any great length of time. Glare is more pronounced with the lamps of higher wattage, but even with the smaller lamps it is troublesome. Therefore, except under unusual circumstances, all lamp filaments should be concealed or shaded in some manner. Lamps of 15 to 100 watts inclusive have the new

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inside-frosting which reduces the brightness materially, but even with these inside-frosted lamps some form of reflector or shade is ordinarily recommended. Reflectors not only reduce glare by shielding the lamps from direct vision to a considerable extent, but they also provide better and more efficient illumination by directing the light down where it is wanted.

### The Right Lamp for the Reflector

A particular size and type of reflector is usually designed for a particular size and type of lamp. Most reflecting equipment is



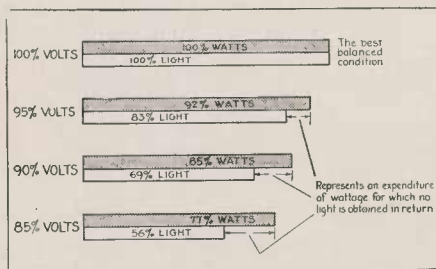
A reflector designed for a small lamp will not fit a large one; neither will a reflector designed for a large lamp give good results with a small one.

about as useless with the wrong lamp as is a hat that is too small for a man's head. When the wrong lamp is used in a reflector, or if the reflector itself is poorly designed, the light is usually not directed where it is wanted, it may be wasted in places where it is not needed, and there is

likely to be troublesome glare. It pays to use good reflectors equipped with the right lamps.

### Lamps of the Proper Voltage

The incandescent lamp is designed to operate at a certain voltage; best and most economical results are obtained only when it is operated at the voltage marked upon the bulb. If a lamp is operated under-voltage (for example, a 115-volt lamp operated on a 110-volt line) the chart shows that the loss of light greatly exceeds the reduction in wattage. On the other hand, if a lamp is operated over-voltage (for example, a 115-volt lamp operated on a 120-volt line) the lamp burns brightly but its life is unduly shortened.



It is uneconomical to burn lamps under-voltage; the loss of light greatly exceeds the reduction in wattage.

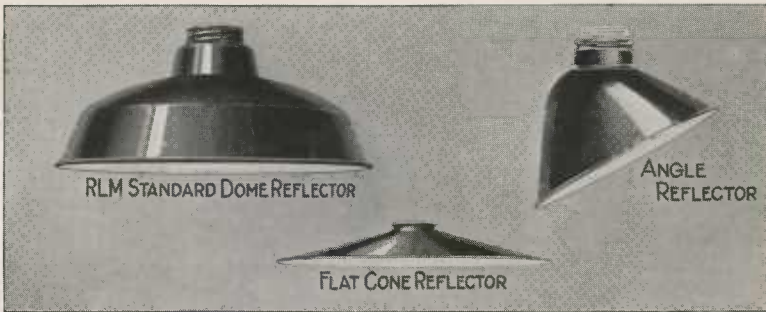
Consequently, when purchasing lamps for the farm, it is of vital importance that lamps of the proper voltage be procured. The correct figure, if not known, can be obtained from the Power Company.

## FARM LIGHTING

### LIGHTING THE FARM BUILDINGS

#### Lighting Equipments

For lighting ordinary work places, a type of reflector is available which combines ruggedness, simplicity, low cost, and high efficiency. It is termed the Reflector and Lamp Manufacturers' Standard (abbreviated RLM Standard) Dome Reflector, and is made by a number of different manufacturers in accordance with specifications



Typical enameled-steel reflectors for lighting farm buildings.

as regards performance and quality. As shown in the accompanying photograph, it consists of a dome of steel, heavily porcelain-enameled, white on the inside. It is designed to take fullest advantage of the higher efficiencies of the larger MAZDA lamps. It prevents the loss of light upward against ceilings where light is ordinarily not wanted, and instead redirects it downward where it is needed. With this type of reflector the lamp filament is visible from below, and in some locations this may cause troublesome glare. In such cases, inside-frosted or white-bowl lamps should be used. With lamps of these types the light is diffused sufficiently to reduce the brightness and the installation becomes more comfortable to the eyes.

For certain services, where light is desired in a particular direction, angle reflectors are recommended. A typical angle reflector is shown in the accompanying illustration. It is porcelain-enameled, white on the inside.

In some cases where an extremely low ceiling prevents the use of RLM reflectors, flat porcelain-enameled steel reflectors are recommended. Although they do not reduce the glare by shielding the lamp from direct vision, they assist somewhat in directing light downward.



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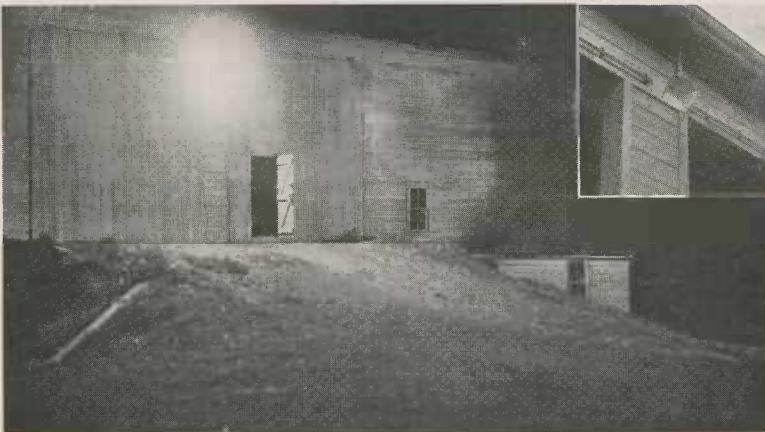
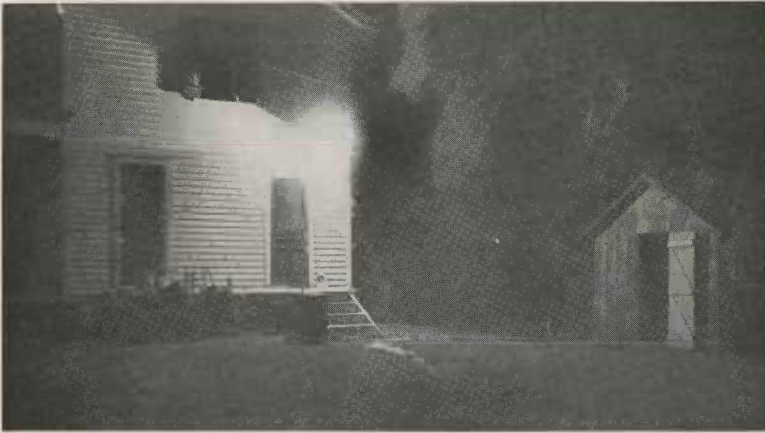
## FARM LIGHTING

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### Yard Lighting

Surveys of rural lighting show conclusively that the farmer appreciates, and nearly always provides, yard lighting. Lighting here eliminates the uncertainty—the stumbling over the misplaced plow, the barking of shins against a momentarily forgotten machine—resulting from the plunge into blackness when leaving the lighted house or barn.

Fortunately, a little light goes a long way on a dark night, so that a few suitable lighting units, mounted at appropriate points,



A path of friendly light between house and barn.

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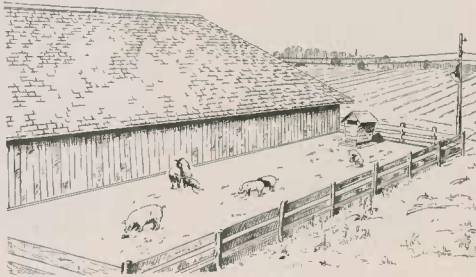
## FARM LIGHTING

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give sufficient light for comfortable progress. Where the lighting unit can be suspended from a bracket arm mounted on a convenient pole or the corner of a house or barn, the RLM reflector with 100-watt or 150-watt MAZDA lamp is recommended. In some locations angle reflectors can be used effectively to flood an area from the side of a building. Everyone knows how difficult it is to see beyond a bright light on a dark night. Such a condition would, of course, defeat the purpose of yard lighting to a considerable extent; to avoid this difficulty, all yard lights should be mounted high—15 feet and upward.

Yard lights must be capable of withstanding severe conditions of wind and weather. The ordinary three-screw shade holders are not sufficiently rugged for this outdoor service; holders should be weather-proof and attached firmly to the reflectors. Attention is also called to the fact that the bulbs of gas-filled lamps—50 watts and above in the 115-volt class—become sufficiently hot in service so that they are likely to break if exposed to rain. A reflector ordinarily provides ample protection against such breakage, but in violent storms a bulb may break even in a reflector. The permanent remedy here is the use of a “dust-tight” or “vapor-proof” unit, in which a glass plate or globe protects the lamp bulb.

Yard lighting has the additional advantage of discouraging nocturnal prowlers. The marauder who finds himself suddenly enveloped in a



Yard lights are often very convenient for such places as outdoor feeding pens.

flood of light, realizes that he has become an easy mark for the watchful farmer, and usually flees at top speed. The system may be connected so that a single switch in the master's bedroom will turn on all the yard lights. In truck gardens, orchards, vineyards, poultry houses, etc., it is sometimes desirable to install a few protective lights connected on this same circuit. Similarly, at least one lamp in each room of the house may be wired on a circuit which is controlled by a 3-way switch in the bedroom; thus in an emergency light may be instantly obtained in each room.



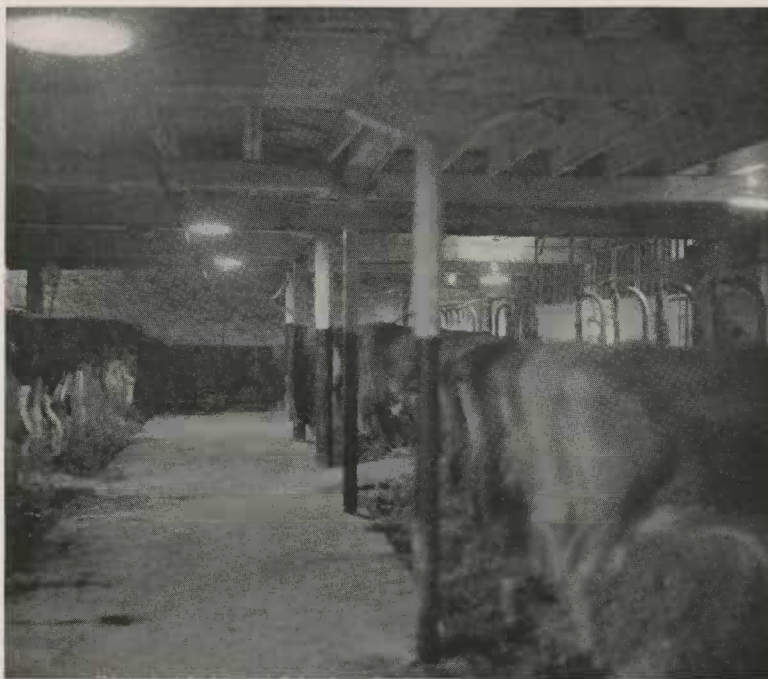
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## FARM LIGHTING

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### Dairy Barn

Artificial light in the dairy barn is often required during feeding, cleaning, and milking hours, especially during the winter months. An adequate lighting system not only facilitates these operations, but minimizes likelihood of milk spoilage. It is the opinion of



Good lighting for the dairy barn—100-watt inside-frosted lamps in RLM reflectors spaced about 20 feet apart.

many dairymen that cows eat and drink more under adequate lighting, and therefore produce more milk.

Most dairy barns have low ceilings which make it difficult to get light to all points without using a considerable number of lamps. To some extent, this difficulty is offset by the usual liberal application of white paint or whitewash on the walls and ceiling, which greatly increases the illumination, distributes the light more uniformly, and softens shadows.

A recommended installation for the dairy barn consists of a row of RLM reflectors with 100-watt inside-frosted MAZDA lamps

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## FARM LIGHTING

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spaced 20 to 30 feet apart over each feeding alley, and over each cleaning alley another row with the same spacing. The reflectors should be mounted as close to the ceiling as is practicable and those over cleaning alleys staggered with those over the feeding alleys. Fairly satisfactory lighting is obtained with 50-watt or 60-watt inside-frosted MAZDA lamps in flat reflectors spaced 20 to 30



The insert shows that without reflectors the illumination is uneven and the general effect is a dimly lighted barn.

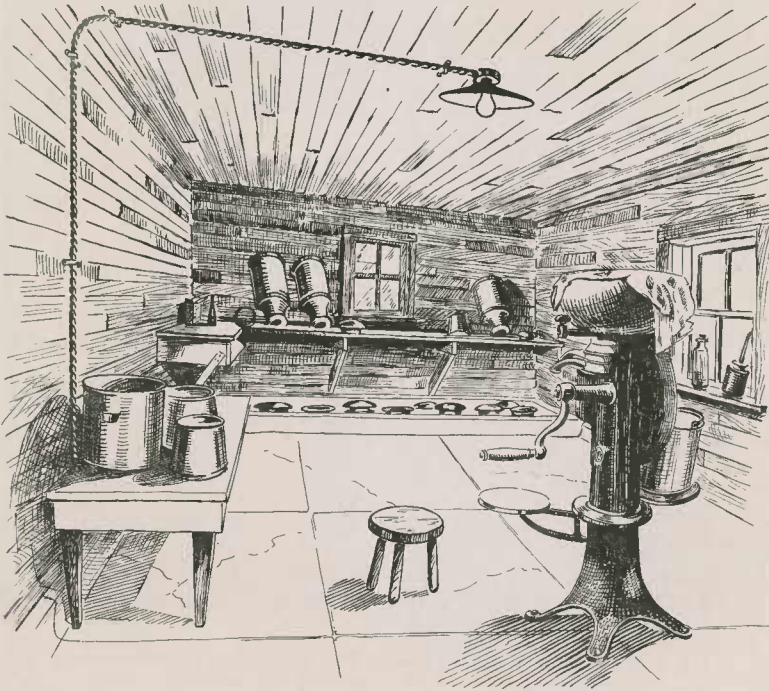
feet apart. Where the dairy barn has a smooth white ceiling that is maintained in a clean condition, the reflectors may be omitted with reasonably good results. The improvement with the use of reflectors is particularly striking where there are dark ceilings or dark beams that would entrap the upward rays if bare lamps were used.

Pull switches, controlling individual lamps or rows of lamps, permit economy in the use of the lighting system. The entire area need not be lighted at one time, yet light is quickly available at any desired point.

## FARM LIGHTING

### Milk House

The small cooling and separator house with low ceiling requires but a single 50-watt or 60-watt inside-frosted lamp mounted at the center of the ceiling. Where there are only rafters above, a reflector should in every case be added. Even with a smooth ceiling, a reflector improves the illumination.



Suggested lighting for the small separator room.

In the bottling room of the dairy farm ample light is needed so that the work may be done efficiently and thoroughly. Cleanliness here is essential, and this is furthered by more light. Good results are obtained with RLM reflectors and 60-watt or 100-watt inside-frosted lamps, mounted close to the ceiling and spaced about 10 feet apart each way. Sharp shadows make such operations as bottle-cleaning very difficult; for that reason the use of bare lamps without reflectors should be avoided in the bottling room.

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## FARM LIGHTING

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This separator room is lighted by a 60-watt lamp in an RLM reflector.



Good lighting is an important part of the working equipment of the bottling room.



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## FARM LIGHTING

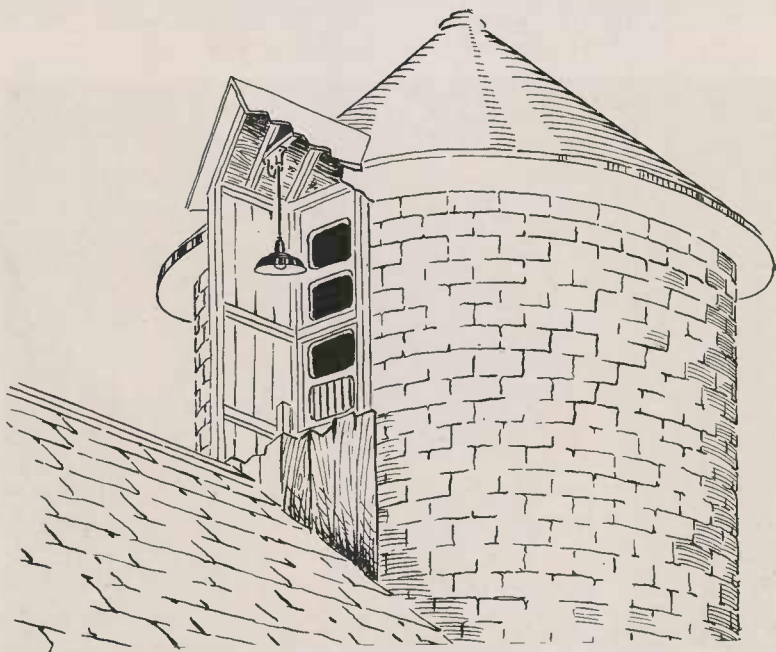
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### Silo and Chute

Where the silo chute is enclosed, or where there is a built-in space between silo and barn, the chute and silo are often poorly lighted and there is danger of a fall even during the daytime. When silage is taken out during the dark hours, light must, of course, be provided. Here good lighting spells safety, as well as convenience and freedom of movement.

A 60-watt or 100-watt inside-frosted MAZDA lamp mounted in an RLM or angle reflector near the top of the silo, over the chute or space between silo and barn, and so located that it will direct some light within the silo through the open doors, lessens the danger of a fall and greatly facilitates the handling of silage.

If the lighting unit is mounted on a reel, so that it may be pulled down, it is a simple matter to lower it inside the silo when the latter is being filled. In this case the wire should have the tough rubber outer insulation now in general use for portable service, to minimize fraying and possibility of short circuit.

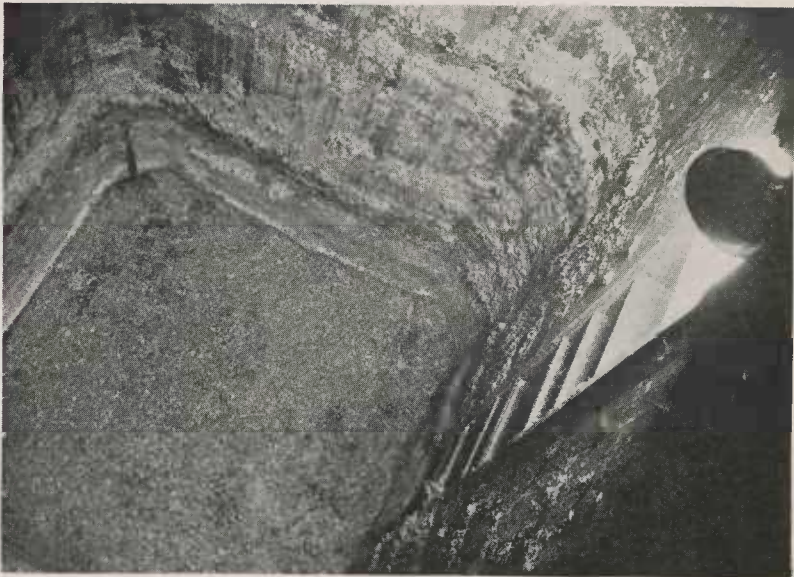


If a reel is provided, the lighting unit may be lowered or pulled inside the silo as desired.

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Looking down into the chute; the light is provided by a 100-watt inside-frosted lamp in an RLM reflector.



Looking down into the silo; here the reflector has been pulled through one of the open doors to light the silo.

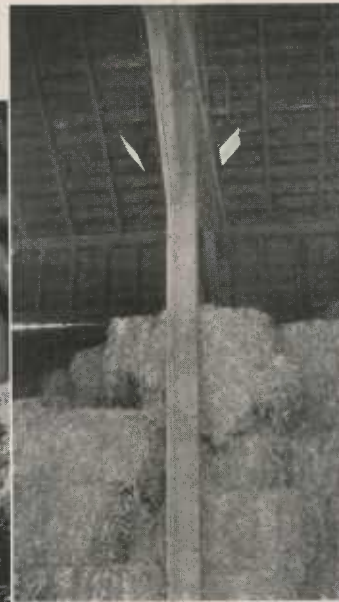


## FARM LIGHTING

### Hay Barn and Loft

To one accustomed to factory lighting, the obvious method of lighting a barn area is by the use of rows of RLM reflectors suspended high above the floor. This type of installation would indeed be desirable were there a considerable amount of work to be done in the barn during the hours of darkness. However, in many barns the only need for artificial light is for getting about for short periods, forking down hay, and like rough operations.

A suggestion for the lighting of typical high-roofed barns and hay mows, where the chief requisite is the ability to move about in safety and comfort, is the use of 100-watt inside-frosted MAZDA lamps in angle reflectors—or dome reflectors set at an angle—



Two to four 100-watt inside-frosted lamps in angle reflectors provide satisfactory lighting for the hay barn of moderate size.

## FARM LIGHTING

mounted fairly high on central posts or tiebeams, or over the door, and directing the light into the bays. Two units directed to each side are needed for good lighting in large barns.

The lighting installation is used for relatively short periods of time and the operating cost is negligible. Hence the comfort and convenience derived from plenty of light easily justifies its use. It is false economy in such locations to re-lamp with low wattage lamps as burn-outs occur.

There should be a switch for the barn lighting system at the most-used entrance. If two doors are often used, as for example an outside door and one below in the dairy barn, it should be possible to turn the lights on or off at either door. This is accomplished by means of switches designated as "three-way" switches.



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## FARM LIGHTING

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### Horse Barn and Stalls

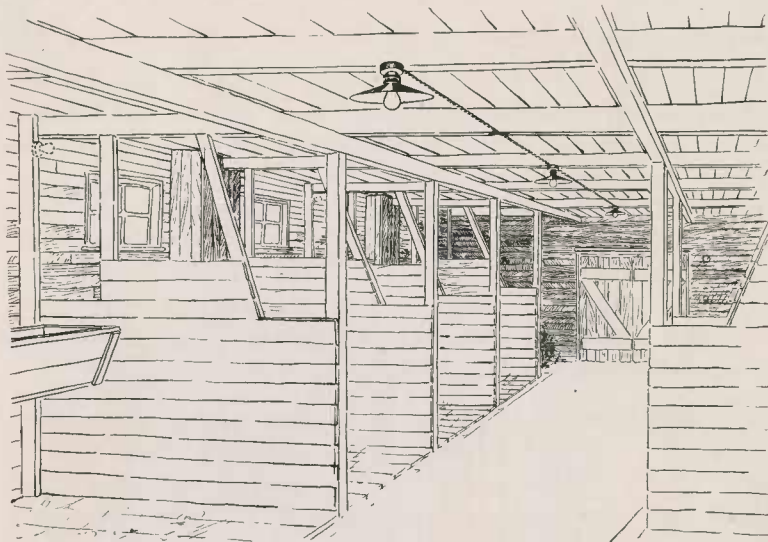
Light is required in the stalls for cleaning, for convenience in getting about at the manger, for harnessing, feeding, etc. Where stalls are located on both sides of a central aisle, sufficient light is obtained from 60-watt or 100-watt inside-frosted MAZDA lamps in reflectors mounted along the center of the passageway and as near the ceiling as is practicable. With this high mounting the maximum amount of light is directed into the stalls on either side. One reflector should be mounted on the partition line between every other pair of opposite stalls; with this arrangement each unit provides light for four stalls.

It is suggested that a 15-watt inside-frosted lamp be mounted, out of reach of the horses' heads, on the wall or on a joist between each two stalls. These lamps should be on individual switches, to be used only when needed. They will be found to be very handy when working in the stalls.



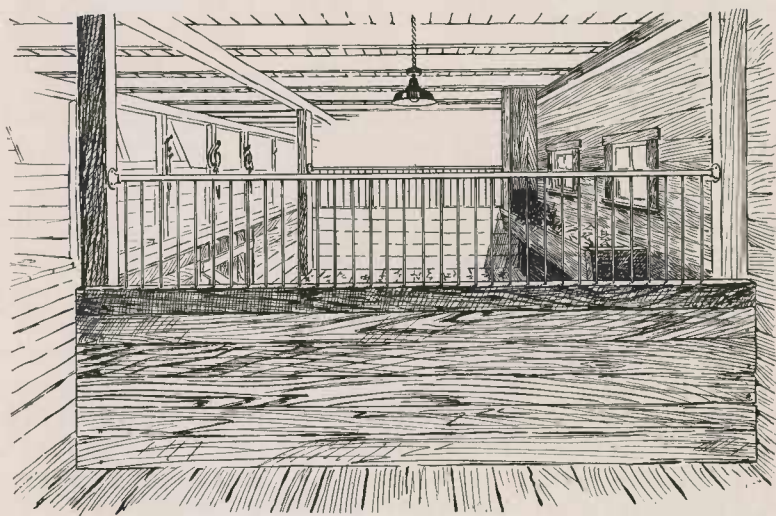
Reflectors should always be used wherever there is a dark colored ceiling.

## FARM LIGHTING



Lighting layout for the horse barn.

For a box stall, a 40-watt or 50-watt lamp in an RLM or a shallow reflector, mounted close to the ceiling at the center of the stall, is ordinarily sufficient. The switch should preferably be located outside the stall door.



A single light is generally sufficient for the box stall.

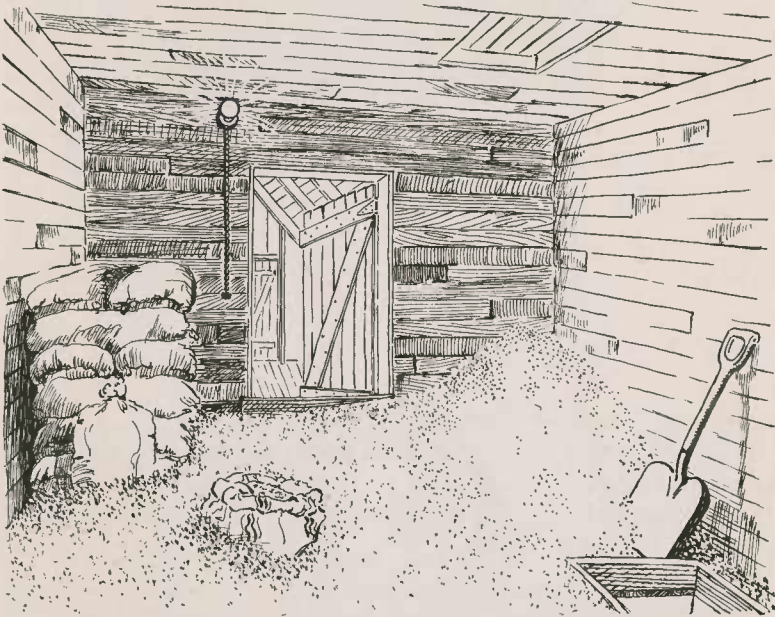
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## FARM LIGHTING

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### Small Granary or Feed Room

In the small granary light is required merely for the handling of feed, and to minimize the danger of a fall through chute or trap. A 25-watt lamp mounted on the wall high above the floor



Here a small lamp close to the ceiling does a good job.

provides sufficient light for the small grain room. The switch should be in a convenient place, such as just outside the door.

An accumulation of dust on the lamp bulb may constitute a fire hazard; trouble is more likely to occur with a lamp of the gas-filled type because of its higher bulb temperature. Hence a 25-watt inside-frosted lamp, which is of the vacuum type, should be used for this service. Furthermore, the bulb should be wiped clean at frequent intervals, for even with lamps of the vacuum type a sufficiently thick coating of dust can absorb enough heat to start a glow or fire. The permanent solution of this problem is the use of a dust-tight or vapor-proof unit designed for just such dusty locations. These units should invariably be used in large grain rooms, mills, etc., where there is considerable dust in the air and the lights are likely to be turned on for long periods of time.

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## FARM LIGHTING

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### Beef Cattle Barn

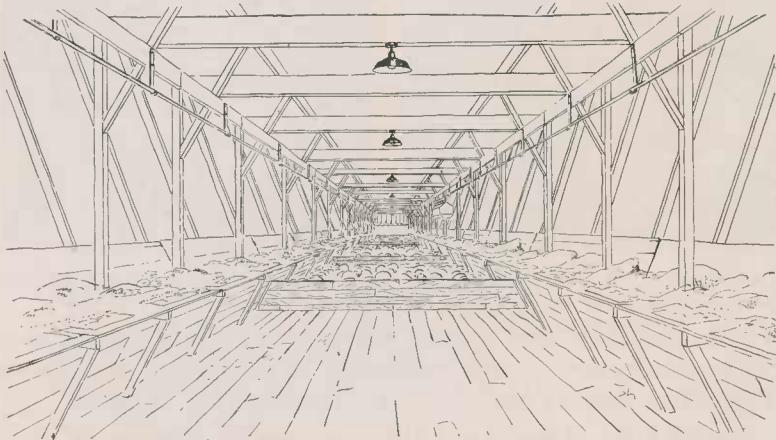
The major part of the work with beef cattle is the feeding. Adequate lighting makes it possible to extend the feeding hours, or to take care of the feeding after night has fallen and other necessary tasks have been performed. It is difficult to establish definite rules for correct lighting that will apply to all beef barns, because of the wide variety of types in use. For the feeding alleys, a single row of lighting units will ordinarily suffice. RLM reflectors with 50-watt or 60-watt inside-frosted MAZDA lamps are suggested, mounted at the ceiling along the center of the alley on from 20-foot to 30-foot centers.

Most feeding barns for beef cattle provide hay storage in the overhead loft. For the lighting of this area see Hay Barns, page 18.

### Sheep Barn

In general, the lighting requirements of sheep barns are similar to those of beef barns. Sufficient light is required to get about, to enable the flock to feed comfortably at night, and to facilitate cleaning on dark days or during night hours. The accompanying sketch shows a typical barn, with suggestions for the lighting layout.

In emergencies, good light in the shepherd's room is especially appreciated. One 100-watt inside-frosted lamp in an RLM reflector mounted at the ceiling, or 10 to 12 feet above the floor, is suggested.



Lighting recommendation for a typical sheep barn—60-watt inside-frosted lamps in RLM reflectors spaced about 20 feet apart.



### Poultry House

Egg production usually goes down in winter. Hens go to roost at twilight and consequently in winter they have less exercise, consume less food, and lay fewer eggs. Artificial lighting of the poultry house in winter lengthens the hen's day; she therefore scratches about more, consumes more food, and lays more eggs during this season, thus more evenly distributing her year's production.

A great many careful tests have been conducted, both with selected flocks and under more ordinary conditions, and in all cases the additional value of the eggs obtained in winter when prices are high has been many times greater than the cost of the light and the additional feed consumed. Sometimes lights have been used only in the morning, sometimes at night, sometimes both morning and night—always with very profitable results.

For egg production the general illumination of the entire poultry house is as important as the illumination on the floor. If the perches are dark the birds will not come down to feed, and if only a small area of the floor is lighted they will crowd together within the lighted space. Hence reflectors that give a widespread distribution



If the perches are dark, some of the birds do not come down to feed.



If the whole pen is fairly well lighted, all the birds come down to feed.

of light should be used. RLM reflectors are recommended, with flat porcelain-enameled steel reflectors as second choice. The use of reflectors reduces materially the lamp wattage required.

Tests\* have shown that a fairly uniform illumination of about one foot-candle upwards is desirable. This is obtained with

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\* By F. L. Fairbanks, Cornell University.

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## FARM LIGHTING

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40-watt or 50-watt inside-frosted lamps in RLM or flat reflectors mounted near the ceiling on a line midway between the front of the house and the front of the dropping boards. One light should be provided for about every 200 square feet of floor area.

To avoid sudden changes in the habits of the flock, the artificial day should be lengthened gradually in the fall, and reduced gradually in the spring. A recommended practice in winter is to light from 5:00 a.m. until daylight, and from dusk until 7:30 to 8:00 p.m. There is no objection to turning the lights on suddenly, but if they are turned off suddenly and the flock is plunged into unexpected darkness, the birds fly about, knock one another off the perches, and many roost on the floor. Hence some arrangement should be provided to extinguish the lights gradually, to simulate the effect of the natural approach of twilight. A satisfactory method of doing this is to dim the lamps down to at least half voltage (about 7 per cent candlepower) for a period of ten to fifteen minutes before turning them off entirely. When the lamps are dimmed, the hens, thinking that nightfall is approaching, go to roost in their accustomed manner. Such dimming may be accomplished by connecting the lamps on two circuits, with an equal number of lamps of the same wattage on each. The two circuits are connected in parallel for ordinary operation and in series for dimming; with the latter connection each lamp operates at half voltage. Dimming can also be accomplished by means of a rheostat connected in series with all the lamps.†

For controlling the poultry house lighting system, where lights are used to increase winter egg production, it is desirable to have a time switch to turn the system on and off at the proper hours. There are several inexpensive clock switches on the market.

At night a heavy feeding should be given to insure full crops upon going to roost, and food and water should be available as soon as the birds leave the roosts in the morning. A simple device to keep the water from freezing overnight may be constructed by soldering a tin can over a hole in the bottom of the water container and placing a 15-watt lamp inside the can. The lamp is left burning all night in severe weather.

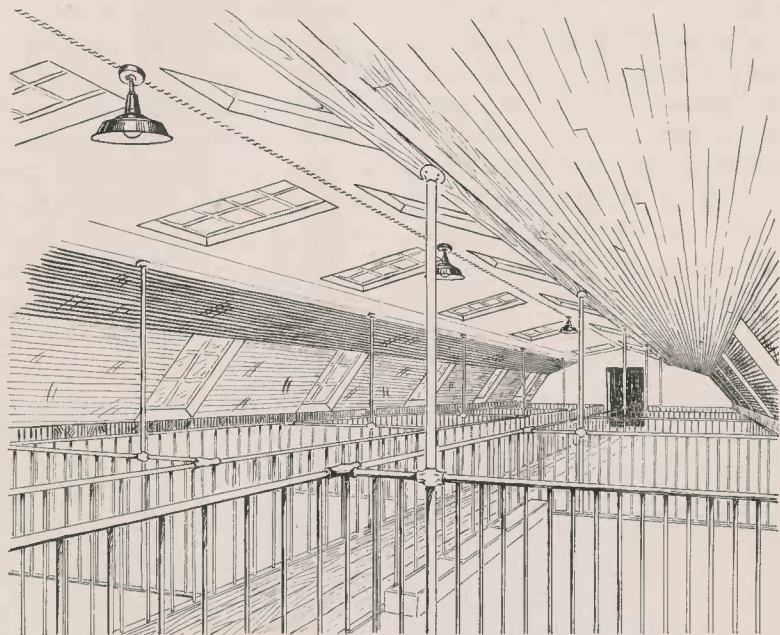
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† See Bulletin No. 134, Agricultural Experiment Station, State College of Washington, on "Methods of Dimming Lights for Poultry Houses."

## FARM LIGHTING

### Hog House

The large hog house, and the community hog house, should be lighted. With the usual gambrel-roof type of house, good lighting is obtained with reflectors mounted as high as practicable along the center of the ceiling, spaced 10 to 20 feet apart, and equipped with 50-watt inside-frosted lamps. A suitably placed yard light will ordinarily care for the outdoor feeding trough.



Lighting layout for a typical community hog house.

### Farm Shop

Adequate lighting in the farm shop makes repair work at night possible and convenient; it becomes unnecessary for the farmer to break into his day for the many minor repairs. To facilitate work on machinery there should be freedom from heavy shadows. This is obtained by the use of more than one light source. Excellent results will be obtained from RLM reflectors with 100-watt inside-frosted lamps mounted 10 feet above the floor and spaced about 10 feet apart each way. One of these units should be hung directly over the bench, or two if the bench is long. An extension cord, with wire guard to protect the lamp, will be found useful for working



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## FARM LIGHTING

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about machinery. The outer insulation of the cord should be of tough rubber; ordinary lamp cord soon becomes frayed and worn in this service. There is a 50-watt MAZDA Rough Service lamp which is designed especially to withstand the bumps and shocks of extension-cord service.



For the work bench of ordinary size, two 100-watt lamps in RLM reflectors provide excellent illumination.

### Garage

For lighting a one-car garage, a 60-watt or 100-watt inside-frosted lamp is suggested, located above the hood of the car. For a two-car or three-car garage, a lamp should be mounted above the hood of each car. Flexibility of lighting can be obtained by suspending the lamps from a wire, stretched across the garage near the roof, along which the lamps can be slid as desired. Fair results are obtained in a two-car garage with one lamp in the center of the ceiling. If work is to be done on the cars and trucks at night, a good extension cord is a necessity.

An especially convenient arrangement is to have three-way switches for the garage lights—one switch being in the garage near the door and one just inside the door of the house leading to the garage. With this switching arrangement the garage lights can be turned on upon leaving the house, and turned off upon leaving with the car. Upon returning the lights can be left on until the house is reached. Another desirable feature is a switch on a post at the entrance to the farm, mounted so that it can be turned on from the driver's seat, to control the garage lights and also one or more of the yard lights.

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## FARM LIGHTING

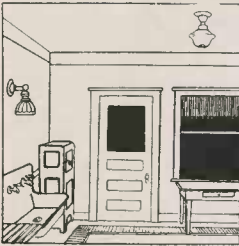
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### LIGHTING THE FARM HOME

#### Kitchen

The kitchen is the workshop of the farm home. Here, besides the cooking for the family, there is the cooking and baking for hired help, the canning, preserving, butter making, and caring for milk. No other addition to the kitchen equipment will do as much toward making it a cheerful pleasant place as will good lighting.

Good lighting in a kitchen is obtained from a 100-watt inside-frosted lamp or a 150-watt Daylight lamp in an enclosing white glass globe at the ceiling in the center of the room. Over the sink, a 50-watt inside-frosted lamp or a 60-watt Daylight lamp shielded by a dense glass shade is especially desirable to eliminate troublesome shadows at this important working place. In a large kitchen an additional light of the same type is useful over the range.

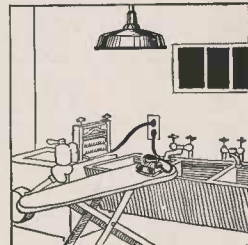


Convenience outlets are very important in the kitchen to provide for the electric iron or other electrical equipment without interfering with the lighting. Several such outlets should be located in the walls about four feet above the floor. The duplex convenience outlet provides two outlets for the installation cost of one.

Since dark colors absorb most of the light striking them, it is well to finish the kitchen in a cheerful color such as cream, light buff, or light green. If desired, the lower walls may be of a darker tone.

#### Summer Kitchen

The summer kitchen is often a built-in porch used for cooking and ironing in hot weather. If the walls and ceiling are light colored, a white glass enclosing globe, mounted at the ceiling and equipped with a 100-watt inside-frosted lamp or a 150-watt Daylight lamp, provides very good lighting. If the walls and ceiling are dark, an RLM reflector, mounted close to the ceiling and equipped with a 100-watt inside-frosted lamp or a 150-watt white bowl Daylight lamp, gives good results. One or two duplex convenience outlets should be installed here as in the kitchen.

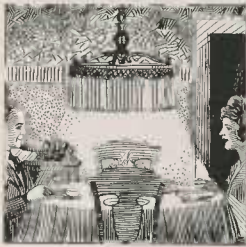


## FARM LIGHTING

### Dining Room

The center of interest in the dining room is, of course, the dining table. The central lighting fixture, therefore, should be designed to provide a strong illumination on the table itself, with a soft light on the faces and a lower level of illumination throughout the room.

With the development of modern lighting equipment, interest is again being attracted to the dome fixture, and today there are very attractive and practical dome fixtures which provide excellent lighting for the dining room. The dome was very popular some years ago, but largely lost favor because it was too wide and too shallow to conceal the lamp bulb, or because it was not hung at the proper height above the table for good lighting effect, being either hung so low that it interfered with seeing across the table or so high that those seated around the table were subjected to glare from the exposed lamp bulb. The proper position for a dome is with its lower edge about twenty-four inches above the table top. A 100-watt inside-frosted lamp is recommended for this type of fixture.



Another excellent fixture for the dining room is the shower, with 40-watt or 50-watt inside-frosted lamps. It should be hung low, about thirty-six inches above the table top, and the lamps should be fitted with shades of glass, parchment paper, or silk. These shades should be deep enough and dense enough to prevent glare.

The candle fixture, with 40-watt or 50-watt inside-frosted lamps, is also popular. Too often, however, unshaded lamps are used, with the result that the walls and ceiling are brightly illuminated while the table is dim and shadowed. Good shades, in harmony with the color scheme of the room, should always be used with shower and candle fixtures.

At least two convenience outlets should be provided in the dining room. Here again duplex outlets are desirable, as one duplex outlet will supply two appliances at once.

If the dining room is between the kitchen and the living room, the main dining room light may be wired with a switch at each door.



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## FARM LIGHTING

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### Living Room

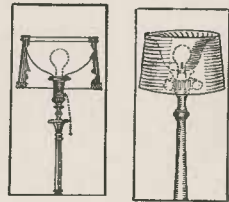
The farm living room generally serves as the business office of the farm and often as the sewing room. Satisfactory types of ceiling fixtures for the farm living room are shown in the accompanying sketch. The two upper ones are classed as "semi-indirect"



units—that is, they direct most of the light upward to the ceiling, whence it is reflected downward as soft, comfortable illumination. In the unit at the upper left, a 150-watt or 200-watt clear lamp should be used, while the one at the upper right employs 40-watt to 60-watt inside-frosted lamps. With a high ceiling the candle fixture may be used with good results, or the shower fixture close

to the ceiling is also appropriate. As in the dining room either type should be provided with decorative shades of glass, silk, or parchment paper, harmonizing with the color scheme of the room; inside-frosted lamps of 40 or 50 watts are recommended, depending on the size of the room.

While a central ceiling lighting fixture usually furnishes the general illumination for the living room, it is well to have at least two or three portable floor or table lamps, as they make possible a wide variety of decorative schemes and afford a flexibility of light control obtainable in no other way. One type of portable, employing a single 150-watt or 200-watt lamp in an enclosing globe of prismatic glass or white diffusing glass, provides upward light for general illumination and a soft downward light for reading or sewing. Another type uses one lamp of 100 to 200 watts in an inverted mirrored-glass reflector for general illumination, and two 40-watt or 50-watt inside-frosted lamps below the reflector on a separate circuit, for use when a local light is desired. All of these "direct-indirect" portable lamps, such as are shown in the accompanying sketches, have silk or parchment shades enclosing the reflector, and they contribute a distinct decorative touch to any room.



A portable lamp should be selected only after seeing what lighting effects it produces. The height of the standard, the depth of the shade, and the location of the lamp bulb within the

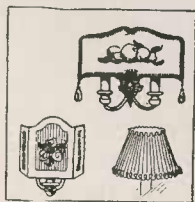


## FARM LIGHTING

shade are points which merit inspection. In the case of a table lamp, for example, the shade should be deep enough and dense enough to conceal the lamp bulb from view, yet the spread of light should be sufficiently wide to illuminate a book held by a person reading beside the table.

A good floor lamp or "bridge lamp" should be placed beside the desk where the farmer does his bookkeeping and accounting. Sometimes this lamp will also serve when using the sewing machine, although usually a second floor lamp is desirable.

In the living room, and occasionally in the dining room, wall brackets may be employed to create a cheerful atmosphere and to make the room more attractive. It should be kept in mind, however, that wall brackets are largely decorative and must not be relied upon to provide any appreciable amount of illumination. They should be equipped with 15-watt or 25-watt inside-frosted or flame-tint lamps, properly shaded.



Convenience outlets should be installed in the living room so that portable lamps may be used anywhere in the room, and so that they may be moved when it is wished to rearrange the furniture for a change of atmosphere. A duplex convenience outlet near the sewing machine will provide for a floor lamp for use when sewing, and also for the sewing machine motor.

If no ceiling lighting fixture is used, it will be found convenient to have one of the outlets for a portable lamp wired with a switch near the door from the front porch, so that a light may be easily turned on when entering the room.

### Stairways and Halls

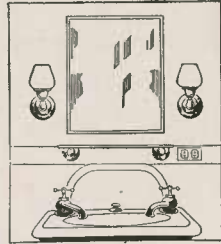
A 40-watt lamp in an enclosing shade, located so that the stair treads will be well lighted, is recommended for the hall. In an unusually long hall, two such units may be required, or one may be supplemented by a small table lamp at the other end of the hall. A small night lamp in the upper hall, requiring little energy and supplying a low level of illumination, is often very useful. Three-way switches should be installed for the hall lamps, one at the head of the stairs and one at the foot, so that the light may be turned on or off at either place.



## FARM LIGHTING

### Bathroom

In a bathroom of ordinary size, proper lighting at the mirror is adequate for the entire room. The recommended lighting consists of brackets on both sides of the glass, about sixty inches above the floor, fitted with 50-watt inside-frosted lamps in diffusing glass shades. A single outlet above the center of the mirror, employing a 60-watt inside-frosted lamp in an opal glass reflector to direct the light downward, gives fair results except that the light is not good for shaving under the chin. A single bracket on only one side of the mirror is not satisfactory because light is provided for but one side of the face. In a large bathroom the mirror lighting should be supplemented by a 100-watt lamp in an enclosing globe at the center of the ceiling.



The light tones of paint, wall paper, or tile used in bathrooms are useful in raising the general level of illumination in the room, as well as in giving an air of cleanliness.

### Bedrooms

For the bedroom a 60-watt or 100-watt lamp in a semi-indirect ceiling fixture, a decorated enclosing globe, or a deep shade gives good results. A shower fixture is also suitable. A small bedroom may be lighted satisfactorily by a central fixture alone. In a larger room, however, a central fixture alone is usually unsatisfactory, because when looking in the mirror the light falls on the back and not on the face. To overcome this difficulty, shaded wall brackets should be placed on both sides of the mirror and level with the face. Bracket lamps mounted on the sides of the dresser and supplied from a convenience outlet permit any desired arrangement of furniture in the room.



A convenience outlet near the head of the bed serves to supply a small table lamp for reading, or a heating pad may be connected there when the bedroom is used as a sickroom.



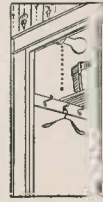
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## FARM LIGHTING

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### Clothes Closets

The clothes closets in a farm house are usually quite large and serve as store-rooms to a certain extent. There are few locations where plenty of light affords such great convenience; hence an inside-frosted lamp of 40 to 100 watts, depending upon the size of the closet, is recommended. Even with a 100-watt lamp, the current cost is negligible because the light is burned only a few minutes a day at the most. The lamp should be placed directly over the doorway, inside the closet, with a switch conveniently at hand. The pull-chain socket has proved best in this location from the standpoint of economy and convenience.



### Porch

An enclosing unit similar to the hall lighting unit—tight-fitting to keep out bugs and dust, non-corrosive, and preferably fitted with a globe smooth on the outside—is recommended for the porch, with the switch near the most-used door. A 40-watt lamp is recommended.

### Cellar

If the cellar is used as a laundry or occasionally as a workshop, it should be provided with one or two RLM reflectors at the ceiling, above the tubs or work bench, with 100-watt inside-frosted lamps or 150-watt Daylight lamps. Where there is a furnace in the cellar, an RLM reflector with a 100-watt lamp should be placed close to the ceiling in front of the furnace door. If no work is done in the cellar, a bare lamp alone will suffice. A switch, controlling one or two of the cellar lights, should be at the head of the cellar steps.



For the fruit cellar a 60-watt or 100-watt inside-frosted lamp, controlled by a pull-chain socket, is recommended. Here, as in a clothes closet, the current consumption of even a large lamp is negligible because it is burned only for short periods, and good light is a great help in selecting the desired kind of fruit, especially if the jar labels have dropped off.





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## FARM LIGHTING

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### FARM WIRING

Several types of wiring are available for farm buildings. In one type, metal provides the mechanical protection for the wire and its insulation; in another type, tough and substantial non-metal insulation protects the wire from injury; in a third type, ordinary insulated wire is kept from touching the building by the use of knobs, tubes, and cleats.

#### Metal Protection

Metal protection may be either rigid or flexible. The rigid system, such as conduit, consists of a continuous metal piping ending at switches and outlet boxes; after the conduit is in place the insulated wires are drawn into it. The flexible system consists of a pliable metal protecting sheath; with some types the wires are drawn into this flexible conduit after it is in place; with others, such as "BX" armored conductor, the flexible metal sheath is sold complete with the insulated wires already in it, and it is cut off in the desired lengths as the job progresses.

In dairy buildings, particularly in those that are damp, there is likelihood of moisture and fumes from the animals condensing within conduit and ultimately rotting the insulation of the wires and causing trouble. Therefore "BX" armored conductors, or conductors covered with tough non-metal insulation, are recommended for wiring such farm buildings, and they are usually best for all farm buildings. An additional advantage of these systems is that the sheaths require no insulation from the buildings. They may be drawn through holes or fastened to walls, joists, ceilings, etc., with metal clips.

In any armored cable or conduit system, care should be taken to have the sheath or conduit and metal parts well grounded. The purpose of grounding is to avoid shocks from differences in potential between metallic parts and the ground. All metal parts should therefore be connected to the same ground, or firmly inter-connected.

#### Heavy Insulation

Occasional difficulty has been experienced where a wire happens to make contact with the metal protecting the wires, in that the current-carrying capacity of the metal protection may be less than that of the wires themselves, especially if the metal has corroded, and therefore the metal sheath is likely to overheat upon short circuit. This difficulty is avoided by the practice, widely adopted

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## FARM LIGHTING

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in other parts of the world and growing in favor in this country, of using wires heavily protected by a tough fibrous non-metal covering which provides both insulation and mechanical strength. An example of such wiring, coming into use for portable service, is the cord insulated with a thick layer of very tough rubber.

In some countries this development has taken the direction of a heavily insulated wire for the live circuit and a less heavily insulated wire carrying the grounded return circuit. Sometimes this takes the form of a single wire, heavily insulated from, and surrounded by, a sheath of non-corrosive metal; the sheath carries the grounded return current and in addition provides mechanical protection for the insulated wire. With such a system, wiring costs are at a minimum consistent with safety, and since the wire may be led about the building almost anywhere, plastered up in walls, etc., it is especially applicable for the wiring of existing buildings.

### Knob and Tube

The "openwork" or "knob and tube" system consists of ordinary insulated wires that are further insulated from the building by mounting on porcelain knobs or cleats, or by passing through porcelain tubes or protective loom at walls, joists, etc. While there is no likelihood of fire from insulated wires, moisture and ammonia fumes may rot the insulation, rubbing against walls may wear it, or rats and mice may gnaw it, causing exposed "live" wires; consequently, knob and tube wiring is not recommended in locations where it is subject to these conditions. However, in locations where the insulation is not exposed to mechanical or chemical injury, the knob and tube system is safe and inexpensive.

Where a grounded system is employed it is recommended that no fuses be used on the grounded side—that the grounded wire be continued without fuse or switch up to the incoming circuit from the central station. This, of course, implies the use of single-pole switches. The use of wire with the different conductors designated by different colors of insulation facilitates the carrying through of such a grounded system.

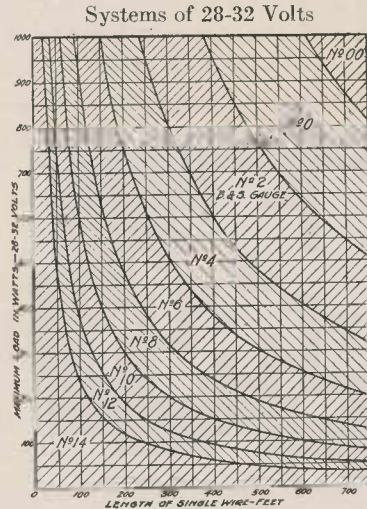
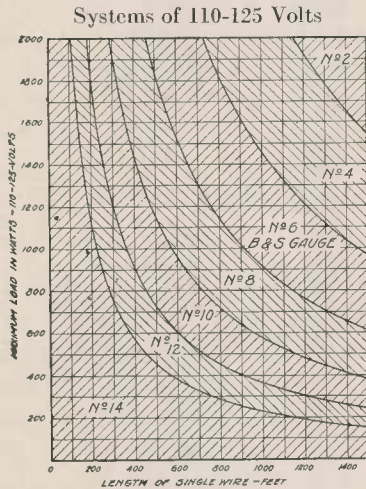
It is advisable in barns, and especially in dairy buildings, to install porcelain or moisture-proof switches and wiring devices. Outdoors, also, these will last longer and they are generally far more satisfactory than ordinary metal devices.

## FARM LIGHTING

Where stock is allowed to run loose, switches should be placed at least six feet from the floor, so that the stock cannot strike them. Wherever possible, it is best to place all wiring and lighting units, as well as switches, entirely out of reach of the stock.

### Wire Size for Lighting Circuits

To avoid excessive voltage drop in a lighting circuit, the proper wire size is found by referring to the accompanying charts. In these charts, the wire length is twice the wiring distance between



points to be wired. Thus, with a 115-volt system, to find the proper size of wire for 600 watts at a distance of 250 feet, requiring 500 feet of single wire, the 600-watt line should be followed horizontally across the chart until it intersects the 500-foot vertical line. The point of intersection lies in the No. 12 zone, indicating that No. 12 wire should be used. For outdoor spaces, No. 12 wire or larger is usually advisable for mechanical strength.

When installing a 28-32 volt plant it is necessary to use wire of large enough size to carry the heavier current which is characteristic of a low voltage system, but at the same time it is good practice to install a wire so insulated that it will be suitable for 115 volts, in case in later years central station service is extended to the farm. In further preparation for this possibility, circuits should be so distributed from common centers that they can be later reconnected for three-wire 115-230 volt service.



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